

**Table S1.** Covariates and potential mediators of the association between maternal pre-pregnancy body mass index and offspring IQ assessed at mean age of 8.6 years, Avon Longitudinal Study of Parents and Children

Covariates	Description
Child's sex	Abstracted from the birth notification.
Maternal age at delivery (years)	Derived by the ALSPAC investigators from mother's date of birth and date of delivery.
Parity	Number of previous pregnancies resulting in a live birth or stillbirth. Derived by the ALSPAC investigators based on responses to several items on one of the antenatal questionnaires.
Married	Self-reported by women on the questionnaire completed at study enrolment. Dichotomized as Yes/No for the analysis.
Pre-existing hypertension	Derived by the ALSPAC investigators based on responses to several items on the questionnaire completed by women at study enrolment.
Smoked tobacco during pregnancy	We created a dichotomous measure of any tobacco smoking during pregnancy (Yes/No) based on the responses to eight questions on four maternal questionnaires completed antenatally and postnatally that asked about tobacco use at different times during pregnancy.
Alcohol consumption during pregnancy	On two of the questionnaires, women were asked about their alcohol consumption in the first three months and the last two months of pregnancy. We collapsed the response categories into none, <1 glass per week, 1–6 glasses per week, and $\geq 1$ glass per day. Each of these categories was then assigned a value of 0, 1, 2, and 3, respectively. The values for the first three and the last two months of pregnancy were then summed to create an index of alcohol consumption, with values ranging from 0 to 6.
Socioeconomic status	<p>We selected four variables (described below) to define socioeconomic status (SES). Because these variables were moderately correlated and to ensure a more parsimonious model, we created a summary measure of SES. Where necessary, we first grouped the responses into five ordinal categories (reverse coding them if needed so that "1" indicated the lowest SES and "5" the highest), and then summed the responses across the four variables to derive an SES index, which ranged from 4 to 20.</p> <p>1. Maternal education: Mothers answered several questions about their schooling on one of the antenatal questionnaires. The ALSPAC investigators used the responses to derive a variable for highest maternal education, coded into five ordinal categories where "1" was lowest (Certified Secondary Education or less) and "5" was highest (Degree).</p> <p>2. The mother's and her partner's social class were variables derived by the ALSPAC investigators based on maternal report of current or previous occupation, which was then categorized according to the 1991 British Standard Occupational system as I, professional; II, managerial and technical; III, skilled non-manual and manual; IV, partly skilled; and V</p>

(unskilled).<sup>1</sup> We created a variable for highest parental social class, where “1” indicated the lowest social class (“unskilled”) and “5” the highest (“professional”).

3. Financial difficulties: The ALSPAC investigators derived a score to indicate the degree of financial difficulty experienced during pregnancy based on the mother’s responses to five questions about the affordability of food, clothing, heating, rent or mortgage, and baby items. Scores ranged from 0 (no financial difficulties) to 15 (maximum financial difficulties). We collapsed and reverse coded the scores to create five categories ordered from the most to the least financial difficulty (1=score of 7–15; 2=score of 4–6; 3=score of 2–3; 4=score of 1; 5=score of 0). Our initial aim was to create similarly sized categories, which proved impossible as about 40% of the cohort had a score of 0.

4. Disposable income: The ALSPAC dataset contains a derived variable for quintile of household disposable income averaged over two observations when the child was 33 and 47 months of age. This measure accounts for family size and composition and estimated housing benefits (and was converted to 1995 prices for comparability among cohort members).<sup>2</sup>

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#### Potential mediators

Pre-eclampsia	The ALSPAC investigators abstracted all blood pressure, weight, proteinuria, and glycosuria measurements that were collected as part of routine antenatal care by midwives or obstetricians. They then derived three hypertensive disorders of pregnancy variables (hypertensive disorder of pregnancy, gestational hypertension, pre-eclampsia) using the International Society for the Study of Hypertension in Pregnancy definitions. <sup>3</sup> For our analysis, the “Pre-eclampsia” group included those with and without pre-existing hypertension. All other non-missing values were classified as “No pre-eclampsia.”
Caesarean delivery	Method of delivery was abstracted from medical records and we created a dichotomized variable to indicate whether a caesarean section was performed.
Preterm birth	Gestational age at birth was recorded in completed weeks from a number of sources, including date of last menstrual period, pediatric assessment, obstetric assessment, and ultrasound assessment. In general, the ALSPAC investigators used the date of the last menstrual period to derive a best estimate of gestational age at delivery. We categorized births before 37 completed weeks of gestation as preterm.
Duration of breastfeeding	A derived variable is available in the ALSPAC dataset that categorizes duration of breastfeeding as never, <1 month, 1-<3 months, 3-<6 months, or ≥6 months, based on responses to several items included on a questionnaire that was mailed when the child was 15 months of age. To simplify the analysis, and because a previous study of breastfeeding duration and offspring IQ reported significant associations only for breastfeeding duration of 6 months or more (compared to no

breastfeeding),<sup>4</sup> we dichotomized breastfeeding duration as none/<6 months or ≥6 months.

Gestational weight gain	Gestational weight gain is captured by several variables in the ALSPAC dataset. We used average weight gain per week (in kilograms), which was calculated as the difference between the first and last weights for women who had at least one weight measurement prior to 18 weeks of gestation and at least one measurement after 28 weeks, divided by the difference in gestational age between the two measurements. We scaled the variable to units of 400 grams for the analysis. <sup>5</sup>
Birth weight	Birth weight was abstracted from a number of sources, including obstetric data, the birth notification, and/or direct measurement by ALSPAC personnel. The ALSPAC investigators derived a “preferred birth weight” based on the criteria described in the KZ file (available on the ALSPAC website). We scaled the variable to units of 100 grams for the analysis.

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**References (Table S1)**

1. Office of Population Censuses and Surveys. Standard Occupational Classification. Her Majesty's Stationery Office: London, UK, 1991.
2. Melotti R, Heron J, Hickman M, Macleod J, Araya R, Lewis G, *et al.* Adolescent alcohol and tobacco use and early socioeconomic position: the ALSPAC birth cohort. *Pediatrics* 2011; 127: e948-e955.
3. Brown MA, Lindheimer MD, de Swiet M, Van Assche A, Moutquin JM. The classification and diagnosis of the hypertensive disorders of pregnancy: statement from the International Society for the Study of Hypertension in Pregnancy (ISSHP). *Hypertens Pregnancy* 2001; 20: IX-XIV.
4. Brion MJ, Lawlor DA, Matijasevich A, Horta B, Anselmi L, Araújo CL, *et al.* What are the causal effects of breastfeeding on IQ, obesity and blood pressure? Evidence from comparing high-income with middle-income cohorts. *Int J Epidemiol* 2011; 40: 670-680.
5. Gage SH, Lawlor DA, Tilling K, Fraser A. Associations of maternal weight gain in pregnancy with offspring cognition in childhood and adolescence: findings from the Avon Longitudinal Study of Parents and Children. *Am J Epidemiol* 2013; 177: 402-410.

**Table S2.** Comparison of parental prepregnancy body mass index (BMI), offspring IQ, and covariates for records included in and excluded from analysis to examine the association between maternal prepregnancy obesity and overweight and offspring IQ, Avon Longitudinal Study of Parents and Children

	Records included in analysis (n=4,324)	Records excluded from analysis because of missing parental BMI or offspring IQ* (n=8,587)
Maternal prepregnancy BMI, %		
Obese	5.6	5.5
Overweight	16	13
Normal weight	79	59
Missing	0	23
Paternal prepregnancy BMI, %		
Obese	7.7	3.0
Overweight	40	15
Normal weight	53	21
Missing	0	61
Offspring full-scale IQ, mean (SD)	105.8 (16.4)	101.6 (16.3)
Missing, %	0	74
Offspring verbal IQ, mean (SD)	108.7 (16.7)	104.8 (16.5)
Missing, %	0	74
Offspring performance IQ, mean (SD)	101.0 (16.9)	97.4 (17.2)
Missing, %	0	74
Male child, %	50	53
Maternal age at delivery in years, mean (SD)	29.3 (4.4)	27.4 (5.1)
Parity, %		
Nulliparous	48	38
Multiparous	51	51
Missing	1.9	10
Married, %		
Yes	85	63
No	14	27
Missing	0.2	9.6
Pre-existing hypertension, %		
Yes	4.1	2.9
No	94	77
Missing	2.1	20
Smoked tobacco during pregnancy, %		
Yes	17	32
No	72	43
Missing	11	25

Index of alcohol consumption during pregnancy**, mean (SD)	1.51 (1.33)	1.38 (1.34)
Missing, %	3.8	26
SES index***, mean (SD)	14.5 (3.3)	13.2 (3.4)
Missing, %	21	58

SD: Standard deviation

SES: Socioeconomic status

\*As with the cohort included in our analysis, multiple births, records where the mother or her partner indicated that the partner was not the biologic father, and records where parental prepregnancy BMI was below 18.5 (underweight) were excluded from this group.

\*\*Values range between 0 and 6. Higher values indicate higher amount of alcohol consumption during pregnancy. See Table S1 for details on how this variable was derived.

\*\*\*Values range between 4 and 20. Higher values indicate higher SES. See Table S1 for details on how this variable was derived.

**Table S3.** Comparison of parental prepregnancy body mass index (BMI), offspring IQ, and covariates for records with and without missing covariate values included in analysis to examine the association between maternal prepregnancy obesity and overweight and offspring IQ, Avon Longitudinal Study of Parents and Children (n=4,324)

	Records with no missing covariate values (n=2,976)	Records with missing values for one or more covariates (n=1,348)	p-value
Maternal prepregnancy BMI, %			
Obese	5.0	6.9	0.02
Overweight	15	17	
Normal weight	80	76	
Paternal prepregnancy BMI, %			
Obese	7.3	8.8	0.03
Overweight	39	41	
Normal weight	54	50	
Offspring full-scale IQ, mean (SD)	106.8 (16.4)	103.4 (16.1)	<0.001
Offspring verbal IQ, mean (SD)	109.7 (16.7)	106.3 (16.2)	<0.001
Offspring performance IQ, mean (SD)	101.8 (17.0)	99.2 (16.8)	<0.001
Male child, %	50	50	0.97
Maternal age at delivery in years, mean (SD)	29.5 (4.3)	28.9 (4.6)	<0.001
Nulliparous, %	52	40	<0.001
Missing, n	---	83	
Married, %	86	84	0.04
Missing, n	---	10	
Pre-existing hypertension, %	4.7	3.1	0.02
Missing, n	---	90	
Smoked tobacco during pregnancy, %	16	28	<0.001
Missing, n	---	497	
Index of alcohol consumption during pregnancy*, mean (SD)	1.54 (1.34)	1.42 (1.30)	0.007
Missing, n	---	166	
SES index**, mean (SD)	14.6 (3.2)	14.0 (3.3)	0.001
Missing, n	---	904	

SD: Standard deviation

SES: Socioeconomic status

\*Values range between 0 and 6. Higher values indicate higher amount of alcohol consumption during pregnancy. See Table S1 for details on how this variable was derived.

\*\*Values range between 4 and 20. Higher values indicate higher SES. See Table S1 for details on how this variable was derived.